

50
92
We claim:

1. A surgical staple comprising:

a base having at least one substantially planar surface,

a flange bendably joined to one edge of the base and having at least one substantially planar surface adapted to cooperate with the planar surface of the base,

a pin bendably joined to the base at an opposing edge, and

a needle removably joined to the pin and comprising a suture needle, wherein the base and the flange each have cooperating surfaces to contact and secure on the pin portions of tissues to be joined together or portions of a graft to an artery.

2. A staple defined in claim 1 wherein the base is configured to be releasably engaged with an associated applying instrument.

3. A surgical staple for securing portions of tissues together or portions of a graft to a tissue comprising:

base means having at least one substantially planar surface for securing tissues or grafts,

flange means bendably joined to one edge of the base means and having at least one substantially planar surface for cooperating with the planar surface of the base means to secure tissues or grafts,

pin means bendably joined to the base means at an opposing edge for holding tissues or grafts, and

needle means removably joined to the pin means for piercing tissues or grafts and comprising a suture needle, wherein the base means and the flange means each have cooperating surfaces to contact and secure on the pin means portions of tissues to be joined together or portions of a graft to an artery.

5

4. A staple defined in claim 3 wherein the base means includes means for releasably engaging an associated applying instrument.

10

5. An instrument for applying a surgical staple comprising:
an elongated shaft having a distal end portion,
a staple holder member at the distal end portion adapted to engage a staple having a base having at least one substantially planar surface, a flange bendably joined to one edge of the base and having at least one substantially planar surface adapted to cooperate with the planar surface of the base, a pin bendably joined to the base at an opposing edge, and a needle removably joined to the pin, and comprising a suture needle,

15

a staple forming member at the distal end portion adapted to bend the pin over a substantial portion of the base and to bend the flange over a substantial portion of the pin, so that the staple is substantially closed, and

20

a handle having a control for actuating the staple forming member.

6. An instrument defined in claim 5 wherein the elongated shaft has a length and width adapted to use in minimally invasive surgery.

03781579.010997

7. An instrument as defined in claim 5 wherein the base is configured to be releasably engaged by the staple holder, and the handle has a control for releasing the staple after it is closed.

5 8. An instrument as defined in claim 5 wherein the staple holder member is also adapted to articulate the staple relative to the elongated shaft, and the handle has a control for actuating an articulating mechanism.

10 9. An instrument as defined in claim 5 wherein the instrument further comprises a needle removal member at the distal end portion adapted to remove the needle from the pin.

15 10. An instrument as defined in claim 5 wherein:
the staple holder member contains at least one staple comprising a base having at least one substantially planar surface, a flange bendably joined to one edge of the base and having at least one substantially planar surface adapted to cooperate with the planar surface of the base, a pin bendably or rotatably joined to the base at an opposing edge, and a needle joined to the pin and comprising a suture needle, wherein the base and the flange each have cooperating surfaces to
20 contact and secure on the pin portions of tissues to be joined or portions of a graft to an artery.

11. An instrument as defined in claim 10 wherein the elongated shaft comprising at its distal end portion a staple has a maximum diameter less than about 20 millimeters.

5 12. An instrument for applying a surgical staple comprising:
an elongated shaft having a distal end portion,
staple holder means at the distal end portion for holding a staple
comprising base means having at least one substantially planar surface for securing
tissues or grafts, flange means bendably joined to one edge of the base means and
10 having at least one substantially planar surface for cooperating with the planar
surface of the base means to secure tissues or grafts, pin means bendably joined
to the base means at an opposing edge for holding tissues or grafts, and needle
means removably joined to the pin means for piercing tissues or grafts and
comprising a suture needle, wherein the base means and the flange means each
15 have cooperating surfaces to contact and secure on the pin means portions of
tissues to be joined together or portions of a graft to an artery,

staple forming means associated with the staple holder means for
bending the pin means over a portion of the base means, and the flange means
over a substantial portion of the pin means so that the staple is substantially closed,
20 and

a handle having control means for actuating the staple forming
means.

13. An instrument defined in claim 12 wherein the elongated shaft has a length and width adapted to use in minimally invasive surgery.

14. An instrument as defined in claim 12 wherein the base means includes means for releasably engaging the staple holder means, and the handle has control means for releasing the staple after it is closed.

15. An instrument as defined in claim 12 wherein the staple holder means includes means to articulate the staple relative to the elongated shaft, and the handle has control means for actuating such articulation means.

16. An instrument as defined in claim 12 wherein the instrument further comprises needle removal means at the distal end portion for removing the needle from the pin.

17. An instrument as defined in claim 12 wherein:
the staple holder means contains at least one staple comprising base means having at least one substantially planar surface for securing tissues or grafts, flange means bendably joined to one edge of the base means and having at least one substantially planar surface for cooperating with the planar surface of the base means to secure tissues or grafts, pin means bendably joined to the base means at an opposing edge for holding tissues or grafts, and needle means removably joined to the pin means for piercing tissues or grafts and comprising a suture needle,

wherein the base means and the flange means each have cooperating surfaces to contact and secure on the pin means portions of tissues to be joined or portions of a graft to an artery.

18. An instrument as defined in claim 17 wherein the elongated shaft comprising at its distal end portion a staple has a maximum diameter less than about 20 millimeters.

19. A method for attaching soft tissues located in the abdominal cavity, chest and retroperitoneal space and for attaching a graft to an artery in these areas comprising:

providing an instrument for applying a surgical staple having an elongated shaft with a distal end portion and having a staple forming member at the distal end portion adapted to bend portions of a staple,

providing at least one staple to a staple holder member at the distal end of the instrument, the staple comprising a base having at least one substantially planar surface, a flange bendably joined to one edge of the base and having at least one substantially planar surface adapted to cooperate with the planar surface of the base, a pin bendably joined to the base at an opposing edge, and a needle removably joined to the pin and comprising a suture needle, wherein the base and the flange each have cooperating surfaces to contact and secure on the pin portions of tissues to be joined together or portions of a graft to an artery.

incising a patient's tissue to create at least one opening into the patient's abdominal cavity, chest or retroperitoneal space,

inserting the distal end of the instrument through the opening, so that the distal end is disposed in the patient,

passing the needle of the staple through a portion of one tissue, graft or artery and through a portion of a second tissue, artery or graft, and

5 actuating the staple forming member to bend the pin over a substantial portion of the base and to bend the flange over a substantial portion of the pin, so that the staple is substantially closed.

10 20. The method defined in claim 19 wherein the method further comprises providing a staple further comprising a base configured to be releasably engaged by the staple holder and releasing the staple from the instrument.

15 21. The method defined in claim 19 wherein the passing and actuating steps are repeated to apply additional staples.

22. The method defined in claim 19 wherein the incising step creates a small incision and wherein the inserting, passing and actuating steps are performed by minimally invasive surgical procedures.

20 23. The method defined in claim 19 wherein the shaft of the needle member is passed through a portion of a graft or artery and through an artery or graft to form a portion of an artery to graft anastomosis.

24. The method defined in claim 19 wherein the artery is selected from the group consisting of the aorta, the coronary arteries, the iliac arteries and the femoral arteries.

5 25. The method defined in claim 24 wherein the artery is at least about 2 mm diameter or larger.

ADD
94
Add #17